

REMARKS

As a result of the foregoing amendment, Claims 1 and 15, the two independent claims have been amended to recite that each of the cyclic carbonate and chain carbonate are present in amounts of 0.1 to 4 weight %. In addition, the recitation of the words "that" and "those" have been deleted from the claims and replaced by the expression "reduction potentials". This clearly obviates the rejection under the second paragraph of 35 USC 112 which should be withdrawn.

In addition, the organic compounds have now been specifically recited in accordance with the original disclosure at page 4, lines 16-22. It is noted that the recitation of the percent by weight finds support in original claim 2.

Claims 2 and 16 have been cancelled. The remaining claims have been amended to conform to the modifications in the independent claims.

Reconsideration and withdrawal of the rejection of claims 1-5, 11-19, and 25-29 as being unpatentable under 35 USC 103(a) over the Negoro et al '459 patent are requested. The Examiner asserts that Negoro discloses a non-aqueous electrolytic solution having a specific combination of organic compounds and solvents which is essentially the same as that presently claimed except that the Examiner concedes that Negoro et al does not disclose the combination of the two organic compounds with two solvents recited in the claims and in particular, the graphite material. The claims have now been amended to more specifically recite the solvent compounds as well as the amount of the organic compounds. Negoro et al. contains no information whatsoever that might suggest this specific combination. In particular, there is absolutely nothing in this reference which in any way suggests the specific combination of the cyclic carbonate and chain carbonate in the small amounts recited in the present claims and in addition, the two specific organic compounds in the solvent system. Applicants have discovered that by using this specific combination, improvements in the discharge capacity retention can be realized. The reference is completely silent with respect to the incorporation of a cyclic carbonate and an acyclic carbonate in the solvent mixture as recited in the present claims. Consequently, one having Negoro et al before them would find nothing therein to suggest the specific combination of components required by the claims as amended and this rejection is improper and should be withdrawn.

Similarly, the rejection of claims 6 and 20 as being unpatentable over the combination of Negoro et al '459 taken with Yamaura '744 should also be withdrawn. Yamaura is relied on for disclosing non-aqueous electrolytic solutions using a non-aqueous electrolyte dissolved

or dispersed in a conventional non-aqueous medium such as vinylene carbonate and further for its asserted disclosure that a non-aqueous solvent may be made from a single carbonate or a mixture of more than one carbonate. However, there is certainly no information in this reference as to the amount of the solvent in a solvent mixture, or in particular, the use of a very small amount of solvent i.e., not more than 4 weight %. In addition, there is no disclosure of the use of two or more specific organic compounds in the cyclic/linear carbonate solvent combination required by the present claims much less the suggestion that it can improve the discharge capacity retention as Applicants have discovered. Accordingly, this rejection is also untenable and should be withdrawn.

Finally, claims 8 and 22 have been rejected as being unpatentable over Negoro '459 taken with Tamura et al '711. Tamura et al is relied on as disclosing a battery for the non-aqueous electrolyte comprising a compound which may be lithium trifluoromethanesulfonate dissolved in a mixture comprising ethylene carbonate and an ethereal solvent. The Examiner concludes that it would be obvious to use an organic sulfonate compound in the electrolytic solution of Negoro et al as reportedly suggested by Tamura et al. However, it is clear that the disclosure in Tamura '711 is not relevant to the invention as recited in the claims as amended.

The Examiner's attention is directed toward the experimental showing provided in the present application. Thus, Table 2 on page 11 shows that when the inventive solvent mixture system in which 1.5 weight % of vinylene carbonate (VC) and 1.5 weight % of propylene carbonate (PS) are dissolved in the combination of propylene carbonate (PC) and dimethylcarbonate (DMC), the discharge capacity retention is improved in comparison to the use of solvent systems in which no additional organic compound is incorporated (see Com. Ex. 1) or wherein one organic compound is incorporated (see Com. Ex. 2-5).

Table 3 on page 12 discloses that an improvement in discharge capacity retention can be obtained when the inventive solvent mixture system comprising 1.5% by weight VC and 1.5% by weight PS are dissolved in other cyclic/linear carbonate solvent combinations. Similarly, Table 4 at page 13 shows that a similar improvement in discharge capacity retention is obtained when the inventive solvent mixture system of VC and PS are dissolved in varying small amounts.

Table 5 at page 14 discloses that the addition of a relatively large amount of VC and PS in the cyclic/linear carbonate solvent combination produces an adverse effect on the discharge capacity retention. This is true even when compared with a case wherein no

organic compounds are added.

Table 6 on page 14 shows that a favorable effect on discharge capacity retention is obtained when the organic compounds are used in an amount of not more than 4 weight %.

Table 7 on page 15 shows that the use of the inventive solvent mixture system also provides an improvement in discharge capacity retention. In this case, 1.5 weight % of VC and 1.5 weight % of PS were dissolved in other cyclic/linear carbonate solvent combinations.

Table 8 on page 16 shows that the use of the inventive solvent mixture system wherein 1.5 weight % of VC and 1.5 weight % of PS were dissolved in other cyclic/linear carbonate solvent combinations improved the discharge capacity retention, as compared to solvent systems in which only one organic compound was incorporated (see Com. Ex. 10).

Table 9 on page 17 shows that the inventive solvent mixture system provides improved discharge capacity retention when other combinations are used as compared with the use of solvent systems in which only one organic solvent compound is incorporated (see Com. Ex. 11-14).

Table 10 on page 18 also shows that the inventive solvent mixture employing various combinations provides similarly improved discharge capacity retention as compared with solvent systems in which only one organic compound has been incorporated (see Com. Ex. 15-18).

Table 11, on page 19 discloses that the use of the inventive solvent mixture system wherein an extremely small amount of 1,4-butanedisulfone (9BS) and a small amount of benzaldoxime carbonate (BAOMC) are dissolved in other cyclic/linear carbonate solvent combinations also improves the discharge capacity retention when compared with the use of solvent systems in which one additional organic compound is incorporated (see Com. Ex. 19-22). This improvement exists also as compared to the use of relatively large amounts of the organic compounds (see Com. Ex. 23) as well as when compared against a combination of organic compounds which do not satisfy the requirements of the claimed reduction potential conditions of the present claims (see Com. Ex. 24-25).

None of the art relied on by the Examiner in any way suggest that such results would be obtained and certainly none of the secondary references render the primary reference any more relevant with respect to obtaining such a result. Accordingly, these rejections are no longer warranted and should be withdrawn.

The Examiner's indication of the allowability of claim 7, 9-10, 21 and 22-24 is

appreciatively acknowledged. It is believed that the amendment to the claims incorporates these changes referred to by the Examiner and further shows that the claims as amended are allowable over the art.

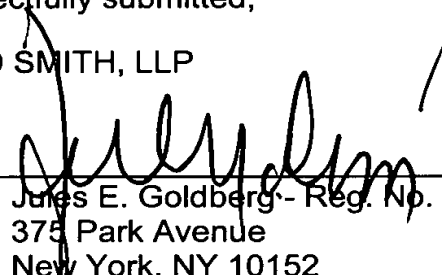
In addition, enclosed herewith are the priority documents for JP 11-143222 of May 24, 1999 and JP 2000-116327 of April 18, 2000.

Accordingly, in view of the foregoing, it is submitted that this application is now in condition for allowance and favorable reconsideration and prompt notice of allowance are earnestly solicited.

Respectfully submitted,

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Enclosures: Certified copies of JP 11-143222
And JP 2000-116327

MARKED-UP CLAIMS

1. (amended) A non-aqueous electrolytic solution comprising at least two organic compounds dissolved in a solvent comprising a cyclic carbonate and a chain carbonate, in an amount of 0.1 to 4 weight % [0.01 to 8 weight %] for each compound,

in which both of said two organic compounds have a reduction potential higher than reduction potentials [those] of the cyclic and chain carbonates, [and]

in which one of the organic compounds has a reduction potential equal to a reduction potential [that] of another organic compound or has a reduction potential lower or higher than a reduction potential [that] of another organic compound by a potential of less than 0.4 V, and

in which said organic compound is selected from the group consisting of vinylene carbonate, propargyl carbonate, benzaldoxime methylcarbonate, a sulfone compound, a sulfonate compound, a sulfone compound, and phenylacetylene.

3. (amended) The non-aqueous electrolytic solution of claim 1, in which said one organic compound has a reduction potential equal to a reduction potential [that] of another organic compound or a reduction potential lower or higher than a reduction potential [that] of another organic compound by a potential of less than 0.2V.

4. (amended) The non-aqueous electrolytic solution of claim 3, in which said one organic compound has a reduction potential equal to a reduction potential [that] of another organic compound or a reduction potential lower or higher than a reduction potential [that] of another organic compound by a potential of less than 0.05 V.

5. (amended) The non-aqueous electrolytic solution of claim 1, in which said one organic compound is vinylene carbonate, propargyl carbonate, or benzaldoxime methylcarbonate, [a carbonate compound] and another organic compound is a sultone compound, a sulfonate compound, or a sulfone compound.

6. (amended) The non-aqueous electrolytic solution of claim 1 [5], in which said one organic compound is vinylene carbonate or methyl propargyl carbonate and another organic compound is 1,3-propanesultone, 1,4-butanedisulfone, 1,4-butanediol dimethane sulfonate, or ethylene glycol dimethane sulfonate.

7. (amended) The non-aqueous electrolytic solution of claim 1 (5), in which said one organic compound is benzaldoxime methylcarbonate and another organic compound is

divinylsulfone.

15. (amended) A non-aqueous lithium secondary battery which comprises a positive electrode comprising lithium complex oxide, a negative electrode comprising graphite, a non-aqueous electrolytic solution containing an electrolyte salt in a non-aqueous solvent, and a separator, in which the non-aqueous electrolytic solution comprises at least two organic compounds dissolved in a solvent comprising a cyclic carbonate and a chain carbonate, in an amount of 0.1 to 4 weight % [0.01 to 8 weight %] for each compound in which bot of said two organic compounds have reduction potential higher than reduction potentials [those] of the cyclic and chain carbonates [and] in which one of the organic compounds has a reduction potential equal to a reduction potential [that] of another organic compound or has a reduction potential lower or higher than a reduction potential [that] of another organic compound by a potential of less than 0.4 V, and

in which said organic compound is selected from the group consisting of vinylene carbonate, propargyl carbonate, benzaldoxime methylcarbonate, a sulfone compound a sulfonate compound a sulfone compound and phenylacetylene.

17. (amended) The non-aqueous lithium secondary battery of claim 15, in which said one organic compound has reduction potential equal to a reduction potential [that] of another organic compound or a reduction potential lower or higher than a reduction potential [that] of another organic compound by a potential of less than 0.2 V.

18. (amended) The non-aqueous lithium secondary battery of claim 15, in which said one organic compound has reduction potential equal to a reduction potential [that] of another organic compound or a reduction potential lower or higher than a reduction potential [that] of another organic compound by a potential of less than 0.05 V.

19. (amended) The non-aqueous lithium secondary battery of claim 15, in which said one organic compound is vinylene carbonate, propargyl carbonate or benzaldoxime methylcarbonate [a carbonate compound] and another organic compound is a sultone compound a sulfonate compound, or a sulfone compound.

20. (amended) The non-aqueous lithium secondary battery of claim 15 [19], in which said one organic compound is vinylene carbonate or methyl propargyl carbonate and another organic compound is 1,3-propanesultone, 1,4-butanessultone, 1,4-butanediol dimethanesulfonate, or ethylene glycol dimethane sulfonate.

21. (amended) The non-aqueous lithium secondary battery of claim 15 [19], in which said one organic compound is benzaldoxime methylcarbonate and another organic compound is divinyl sulfone.